

## ABSTRACT

5 In at least one embodiment, the apparatus of the present invention is a heat  
exchanger which includes a core having a thermally variable size and a support  
structure. To minimize, or eliminate, differential thermal expansion, the support  
structure is connected to the core and thermally deforms to accommodate variations in  
the size of the core. The support structure employs a thermally deformable member  
10 which can be a tie rod with a planar center section. In other embodiments, the support  
structure includes a first strongback, a second strongback, and at least one variable  
thickness tie rod mounted between the strongbacks. The variable thickness tie rod can  
be a broadened end tie rod having an end or ends which are thicker (wider) than a  
center section. The present invention also includes methods of fabrication. One  
15 embodiment includes the steps of obtaining a tie rod having a substantially uniform  
thickness and forging the tie rod to define a planar center section. Another  
embodiment includes obtaining a tie rod of uniform thickness, forging a first end of  
the tie rod to broaden the thickness of the first end, and applying threads to the first  
end of the tie rod.